

## **Monitoring and Testing of Sensors for a Prototype Real-Time Early-Warning System for Water Security**

**Eric F. Vowinkel, Ronald J. Baker, Jacob Gibbs, and Rachael A. Esralew**

U.S. Geological Survey, 810 Bear Tavern Road Suite 206, West Trenton, NJ 08628

### **Biographical Sketches of Authors**

Eric Vowinkel, Ph.D., is a hydrologist with the USGS in New Jersey. He has been working on water-quality issues for 25 years. Most recently, Eric has been conducting vulnerability assessments of community water supplies in New Jersey as part of NJDEP's Source Water Assessment Program. Eric is the liaison between USGS and USEPA Region 2, Rutgers University, and the University of Medicine and Dentistry of New Jersey. He is a member of the USEPA's National Distribution Systems Research Consortium and is a past President of the NJ Chapter of the American Water Resources Association.

Ron Baker, Ph.D., is a research hydrologist with the USGS in New Jersey. He has been working on point- and nonpoint-source water-quality issues for the past 16 years. He is project chief of the Early-Warning System investigation and recently served as project chief of a statewide assessment of the vulnerability of ground water in New Jersey to contamination by nitrate.

Jacob Gibbs, Ph.D., is a Water-Quality Specialist with the USGS in New Jersey. He serves as a technical advisor to the Early-Warning System project. Jack is a coauthor of the USGS National Field Manual on the Collection of Water-Quality Data.

Rachael Esralew is a hydrologist with USGS in New Jersey. She serves as the field coordinator and database manager for the Early-Warning System project.

### **Abstract**

A prototype real-time early-warning system (EWS) to monitor water supplies for security from accidental or intentional spills is being developed as part of an ongoing 3-year investigation by a consortium that includes the U.S. Geological Survey (USGS), the U.S. Environmental Protection Agency (USEPA), Sandia National Laboratories (SNL), Rutgers University, the New Jersey Department of Environmental Protection (NJDEP), and three water utilities in New Jersey. The investigation consists of three components: (1) monitoring and testing of sensors, (2) modeling source waters and distribution systems to determine optimal locations of sensors, and (3) information management and pattern recognition of water-quality signals for alert systems.

The monitoring and testing of sensors for the EWS concentrates on field testing of the effectiveness of available general sensors, including those measuring temperature, pH, dissolved oxygen, specific conductance, turbidity, chlorine, and oxidation-reduction potential. Specific sensors selected to monitor chemical, biological, and radiological (CBR) contaminants will be deployed in the field after tests by the USEPA Testing and Evaluation Facility or the Environmental Testing and Verification Program, the Department of Defense, the Department of Energy, or other Federal laboratories. Hydrologic-flow and distribution-system models will be used to optimize the location and number of water-quality sensors deployed near source-water intakes (rivers and reservoirs) and in distribution systems.

Sensor signals will be transmitted through the USGS real-time data platform by satellite or by cellular telephone to SCADA systems at the water utilities, SNL, and Rutgers University. If the general and (or) specific sensors detect anomalous water-quality conditions, then alarms will be triggered and appropriate officials warned. To validate the sensor data, water-quality samples will be collected in accordance with emergency-response protocols established by the USEPA National Homeland Security Research Center. These samples will be sent to appropriate laboratories to confirm contaminant presence.